

REMARKS

Claims 1 and 3-7 are pending in this application. In view of the below remarks, Applicants respectfully request that these claims be allowed.

Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over *Ruff et al.* (U.S. Pat. No. 3,668,883). The Examiner acknowledges that *Ruff et al.* fails to disclose a refrigeration cycle being directed to an automotive air conditioning system. However, the Examiner states that the basic function of *Ruff et al.* (to prevent overloading at restart) is generally applicable to all refrigeration cycles, and would have been obvious to an automotive application in order to prevent overloading at restart. Applicants respectfully disagree.

Even assuming that the system disclosed in *Ruff et al.* is applied to a refrigeration system for use in an automotive air conditioner, it would suffer the same problems in an automotive application as discussed in the background of the present application. Namely, if the refrigerant (e.g., carbon dioxide, propane, etc.) leaks because of damage to the evaporator arranged in the vehicle compartment or to piping installed in the vehicle compartment, the occupants can possibly be put in a grave situation such as suffocation due to deficiency of oxygen or outbreak of fire [p. 2.] This is because, for example, *Ruff et al.* fails to disclose, teach or suggest a method for *preventing the refrigerant from flowing in the evaporator*. [claim 3.]

Accordingly, Applicants respectfully request that the rejection of claim 3 be withdrawn.

Claims 1, 4 and 5 were rejected under 35 U.S.C. 103(a) as being unpatentable over *Ruff et al.* in view of *Murata et al.* (U.S. Pat. No. 5,983,657).

The Examiner acknowledged that *Ruff et al.* fails to disclose a check valve. However, the Examiner remarked that *Murata et al.* teaches a refrigeration cycle with a check valve situated between the evaporator and the compressor. The Examiner also remarked that such compressor backflow check valves are common and widely used in the art and that it would be obvious to combine this structure into the refrigeration cycle of *Ruff et al.* to prevent compressor backflow. Applicants respectfully disagree for at least the following reasons.

The Examiner has incorrectly relied upon *Murata et al* to modify the *Ruff et al* system to have a check valve 29 between the evaporator 8 and the compressor 25 to prevent reverse flow into the evaporator (column 4, lines 49-52). Moreover, the Examiner failed to provide sufficient motivation to combine the references for such a modification. For example, the Examiner acknowledged that *Ruff et al.* is not directed toward a refrigeration system for use in either a vehicle compartment or an automobile [Claims 1 and 3] and that *Ruff et al.* does not teach a check valve 79 being at an outlet of the evaporator. *Ruff et al* does not teach or suggest this feature because the check valve 79 is intended to prevent migration of vapor back through the compressor [column 6, lines 51-52], rather than to prevent migration of refrigerant back through the evaporator.

The present invention is specifically concerned with migration of refrigerant back through the evaporator because if the refrigerant leaks because of damage to the evaporator arranged in the vehicle compartment or to piping installed in the vehicle compartment, the occupants can possibly be put in a grave situation such as suffocation due to deficiency of oxygen or outbreak of fire [page 2, lines 12-19]. In view of this, it would not have been obvious

to one of ordinary skill in the art at the time the invention was made to place a check valve between the evaporator and compressor of *Ruff et al.* for preventing refrigerant back flow into the evaporator.

The references cited by the Examiner also teach away from the claimed invention. For example, in *Ruff et al.*, when the system is to be stopped, a control circuit 83 signals the control center to stop the compressor. This is because an objective of *Ruff et al.* is to prevent compressor overloading at start-up. Whereas, in the present invention, “[w]hen the operation of the automotive air conditioner is to be stopped, the solenoid valve 5 is closed to shut off the refrigerant passage between the expansion valve 4 and the evaporator 6 and also the liquid pump 8 is operated, with the compressor 1 kept operating. Consequently, the gaseous refrigerant in the evaporator 6 is sucked out by the compressor 1 and at the same time the liquid refrigerant remaining in the evaporator is sucked out by the liquid pump 8” [p. 8.] Therefore, even if one were to combine the teachings of *Ruff et al.* and *Murata et al.*, the resultant combination would not prevent the leakage of refrigerant into a vehicle compartment.

The Examiner has also mischaracterized the teachings of *Ruff et al.* and failed to properly address all claim limitations of the present invention. For example, *Ruff et al.* discloses that the liquid pump 85 pumps “the liquid from the evaporator 20 through check valve 86 and into condenser 21” [column 6, lines 47-50.] Whereas, claim 1 recites: *a liquid pump arranged in a passage connecting between a bottom of the evaporator and a downstream side of the check valve....* Accordingly, the Examiner has failed to make a prima facie case of obviousness.

In view of the aforementioned remarks, Applicants respectfully request that the rejection of claims 1, 4 and 5 be withdrawn.

Applicants appreciate the Examiner acknowledgement that claims 6 and 7 would be allowable if rewritten in independent from including all of the limitations of the base claims and any intervening claims. However, for the reasons discussed above, all pending claims are believed to be in condition for allowance.

In view of the abovementioned remarks, Applicants submit that that the claims are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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